

A MODULE ON THE USE OF AN ORIGINAL ELECTRONIC STORYBOOK AS A SUPPORT FOR READING COMPREHENSION

Background of the Paper

Reading comprehension is a dynamic process in which active readers use the information gained from both the text and prior knowledge “to build and maintain a coherent representation of meaning” (Goldman & Rakestraw 2000).

As such, reading, and the comprehension that results, is an integral goal of education. Good comprehenders are able to decode words skillfully and have an extensive vocabulary. They are able to build a comprehensive knowledge of the world through reading and can relate what they know to what they have read.

Furthermore, Blachowicz and Ogle (2001) report that “our society will need young people who can identify problems, ask appropriate questions, locate resources and information, and formulate and test solutions to the problems.” Reading comprehension is a skill that students need for today and tomorrow’s society.

In order to create and mold competent readers, schools must guarantee the “attunement of motivational processes with cognitive and language processes in reading.” These “motivational processes are the foundation for coordinating cognitive goals and strategies in reading” (Guthrie & Wigfield 2000). Schools must provide ways to motivate their students to start and to continue reading.

In line with this, studies have shown that the computer inside the classroom has positive motivational influences (Ross, Hogaboam-Gray, & Hannay 1999). Evidence shows that when used appropriately and effectively, "technology applications can support higher-order thinking

by engaging students in authentic, complex tasks within collaborative learning contexts" (Means et al. 1993).

Once established, emerging instructional technologies have a chance to revolutionize the classroom environment. Computer and Internet use are steadily becoming part of the educational landscape (Rowand 2000). These technologies will change what, how, where, when and for whom instruction and learning takes place. If educators use them well, they can prepare a society of life-long learners to easily adapt to rapid changes in work, commerce and daily living—learners who can function and compete successfully in the future's technology-centered world economy.

Multimedia instruction holds much promise for the use of information communication technologies (ICTs) in the classroom. One medium of multimedia instruction is the electronic talking book, which come packaged in CD-ROMs. Talking books allow a variety of enhanced features and advantages which can encourage and foster the development of reading. Research has indicated that children gain much from the interactive features of talking book software. It offers stories that appeal to students across ages, leading to an engaging and motivating reading experience.

Objectives of the Practicum Paper

The main objective of this practicum paper is to create and develop an original electronic CD-ROM talking book and implement it in a class to determine whether it supports reading comprehension skills. This will be done using a module specifically designed for the use of the CD-ROM talking book. The software is to be developed in collaboration with an experienced software designer. The electronic book shall be saved in CD-ROM format and will be created using Macromedia Director software. It will be interactive and multimedia. It is hoped that this

kind of multimedia instruction will facilitate story comprehension. The module will also take note of students' attitude towards using electronic storybooks through a survey questionnaire administered within the classroom. Story comprehension will be monitored through the built-in comprehension test within the electronic book.

The electronic book is intended for the use of the third to fourth grade level of a private grade school for boys. The children in this class range from 8-10 years old. The skills utilized by the student in the electronic book include noting important details, making logical inferences and drawing conclusions about the story. The student is also expected to identify the main idea of a selected text and to show a sufficient level of mastery of the comprehension skills required at his grade level. This shall be measured through the drills and challenges that come within the electronic book.

This practicum paper is based on the simple view of reading along with the cognitive theory of multimedia learning. The design of the CD-ROM book will also draw from Mayer's principles of multimedia design and existing research on talking book software. The presentation should have multimedia features that are integrated, channeled, concise and structured (Mayer 2001 192).

REVIEW OF RELATED LITERATURE

The Simple View of Reading

The simple view of reading states that reading comprehension is the product of decoding and linguistic comprehension (Gough & Tunmer 1986; Hoover & Gough 1990). Decoding is the ability to recognize written text, while linguistic comprehension refers to the ability to understand spoken language (Tiu, Thompson & Lewis 2003). Decoding is measured through

single-word reading, while listening or linguistic comprehension is measured by having the student answer questions about narrated text.

Studies on the simple view of reading showed strong support for the model's two components of decoding and linguistic comprehension (Dreyer & Katz 1992, Gough, Hoover & Peterson 1996). Catts, Hogan, Adlof & Barth (2003) examined the simple view of reading from a longitudinal perspective. The entire research identified which component of the simple view of reading is more important at a particular age level. As students start to mature, decoding becomes less of a factor in reading comprehension while listening comprehension takes on a bigger role. Developmental changes were also observed in poor readers with regards to the simple view of reading, showing the changing criteria for identifying poor readers throughout time.

Based on this research, the design of the drills and framework of the electronic storybook shall concentrate on linguistic and reading comprehension exercises. By supporting the simple view of reading's formula of word recognition and linguistic comprehension, the module is expected to facilitate reading comprehension.

Research on Multimedia Learning

Multimedia is defined as "the presentation of material using words and pictures" (Mayer 2001). Learning occurs when learners can "mentally integrate visual and verbal representations", which come in the form of words and pictures (Mayer 2001 17). When learners seek to connect words and pictures, they experience a deeper understanding than they would from words or pictures alone.

Mayer (2001 41) devised a cognitive theory of how people construct knowledge from pictures and words. The cognitive theory of multimedia learning has three basic assumptions: a)

the dual channels assumption, wherein humans have dual channels for managing visual and auditory information, one for each kind (Paivio 1986; Baddeley 1992) b) the limited capacity assumption, where humans have limited information-processing capability in each channel at one time (Chandler and Sweller 1991; Baddeley 1992) c) and the active processing assumption, which states that humans achieve active learning by selecting the relevant information, organizing this into mental representations and integrating this with existing information (Mayer 1997). These assumptions are seen in Figure 1.

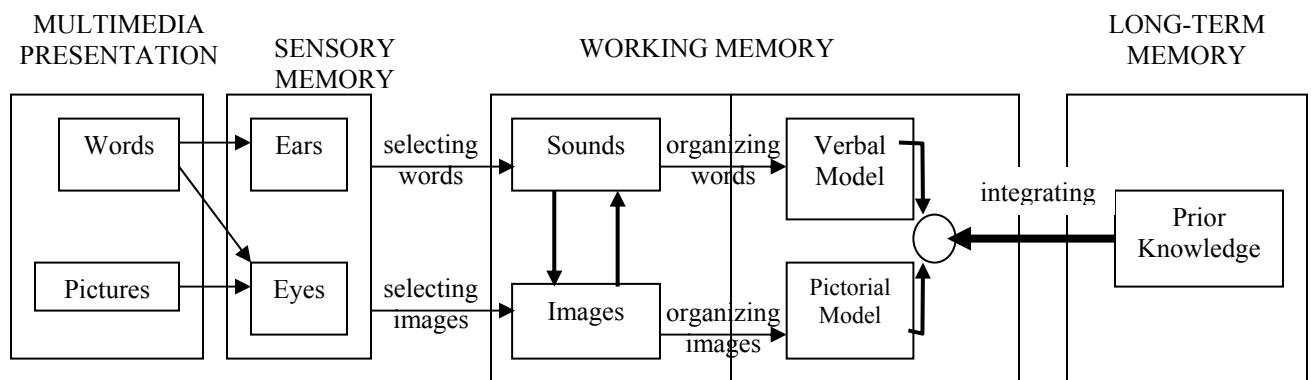


Figure 1: Cognitive Theory of Multimedia Learning

The third assumption is the most relevant to this research, since it directly factors into the design of multimedia instructional materials. In order for active processing to occur, multimedia instruction must facilitate the selection, organization and integration of new information with existing knowledge. As such, it is important to base the design of these materials upon a cognitive theory of multimedia learning. Successful multimedia learning will result only if the learner coordinates and monitors these critical procedures.

Chun and Plass (1997) conducted research where the importance of basing multimedia design principles on a theory of human cognition was highlighted. The study also called for the

design of multimedia instruction to include allowances for learning preferences and cognitive styles.

Mayer (2002) proposed several principles for multimedia design that would lead to a meaningful learning outcome. The researcher found six that would be relevant to this study. These are the: (a) *multimedia* principle, which states that deeper learning is attained from words and pictures than from words or pictures alone; (b) the *contiguity* principle, which states that deeper learning occurs when words and pictures are presented simultaneously and in close proximity to each other; (c) the *coherence* principle, which states that deeper learning results when extraneous and unnecessary words, sounds or pictures are left out from the presentation; (d) the *modality* principle, which says that deeper learning results when words are presented as narration rather than on-screen text ; (e) the *redundancy* principle, which shows that students learn more deeply when multimedia presentations consist of animation and narration rather than animation, narration and on-screen text; (f) the *interactivity* principle, which states that deeper learning is achieved when students can control the pace of the multimedia presentation.

Cognitive overload occurs when “the learner’s intended cognitive processing exceeds the learner’s available cognitive capacity” (Mayer & Moreno 2003). This is because meaningful learning places substantial demand for cognitive resources, which may strain or limit efficient cognitive processing. As a result, Mayer and Moreno (2003 46) proposed nine methods on reducing cognitive load. Six suggestions have been used for this study, including: (a) off-loading, wherein words in the presentation are narrated rather than shown as on-screen text; (b) segmenting, wherein the learner is allowed control over the rate of the multimedia presentation; (c) weeding, where interesting but extraneous material are excluded from the presentation; (d) signaling, wherein signals are placed within the presentation as a guide to help process, select

and organize relevant information; (e) aligning, wherein text are placed near the corresponding parts of the graphic or animation using an integrated presentation; and (f) synchronizing, where narration and corresponding animation are presented simultaneously within the presentation.

Other studies (Moreno and Mayer 2000) showed that adding relevant sounds to a lesson did not hinder students' learning as long as these were easily connected to the rest of the materials. Mayer, Sobko and Mautone (2003) later experimented with the role of the speaker's voice with social cues in multimedia learning, showing that presentations utilizing a human voice speaking in a standard accent led to better performances from students.

Tabbers, Martens and van Merriënboer (2004) conducted experiments on the generalisability of modality and cueing effects within the classroom to determine if Mayer's theories on these two factors would extend to the classroom with the same results. However, results from previous studies on modality and cueing effects were not replicated. Tests showed only a weak cueing effect and even a reverse modality effect. A possible explanation for this could be the design of the study. In previous research conducted, (Mayer and Moreno 1998, Moreno & Mayer 1999, Kalyuga, Chandler & Sweller 1999, 2000), the multimedia instructions were shown as system-paced animations, while in the present study, the multimedia instructions were learner-paced. As such, it appeared that a bimodal presentation is best-suited for system-paced multimedia instructions, whereas visual-only instructions are best-suited for learner-paced multimedia instructions.

In light of conflicting literature on multimedia design principles, this researcher chooses to integrate key features from each study to her own design. The primary design of the interactive CD-ROM storybook shall be based on Mayer's proposed principles for multimedia

design. As in the study conducted by Tabbers and his colleagues (2004), the storybook's navigation features shall enable learners to set their own reading pace. Hotspots shall be glossed so as to inform readers about information contained within the hyperlink. Readers shall also have the choice to activate the narration feature, giving them the capability to read according to their learning preferences and cognitive styles.

CD-ROM Talking Books

CD-ROM talking books are “interactive, digital versions of stories that employ multimedia features such as animation, music, sound effects, highlighted text, and modeled fluent reading” (Labbo 2000). It “provides highly accessible resources utilizing pictures, sound, and animation for readers to interact with” (Wood, Rawlings & Ozturk 2003). As such, talking books, with their interactivity and multimedia features, hold much promise and potential in contributing to children's literacy and supporting reading development.

Studies have shown higher comprehension scores results for students who used CD-ROM talking books (Greenlee-Moore and Smith 1996, Matthew 1997). Talking books were also found to increase sight word knowledge and instructional reading levels of students with low reading ability (McKenna, Cowart and Watkins 1997). These findings were validated in similar research conducted by Lewin (2000), which showed considerable gains from pre-test mean scores in standardized reading tests. Children made great gains in word vocabulary and word recognition. These results have shown that CD-ROM talking books are beneficial, leading to improved cognitive and affective learning outcomes.

Doty, Popplewell and Byers (2001) conducted a study to determine the difference, if any, in the level of young readers' reading comprehension after reading the same story using a interactive CD-ROM storybook or a traditional print storybook. Results showed that the group

reading the story from the CD-ROM storybook scored higher on the comprehension tests. In addition, the authors also suggest that CD-ROM storybooks “eliminated the need for immediate teacher attention while a student is reading by providing immediate assistance when needed.”

Summary

In conclusion, findings from research done on interactive multimedia have shown much promise with regards to the role they play as potential aids for reading comprehension. Despite these promising results however, many talking book software packages are still designed more for edutainment rather than education. It becomes uncertain whether “children are interacting with the story or with the technology” (Matthew 1997). Gamble (2000) states that talking books, as yet, do not “exploit the potential of new technologies in a way that advances the definition of literacy.”

Consequently, the potential for using interactive CD-ROM storybooks is clear yet unrealized. As such, there is a pressing need for further collaboration between reading instructors and multimedia experts in order to create, encourage and maintain “high quality, purpose-made talking book software” (Wood, Rawlings & Ozturk 2003 91). A joint effort by stakeholders must be made towards utilizing this technology. “The time is right for educators to take a lead role in the creative use of technology for children in the new millennium” (Wood, Rawlings & Ozturk 2003 92).

Thus, the proposed software will seek to facilitate reading comprehension by offering original text and exercises created by an educator. Leahy, Chandler and Sweller (2003) caution instructional designers that “a failure to understand cognitive architecture and the instructional design principles that emerge can result in procedures that are random in their effectiveness.” With this study, it is hoped that by basing the design of an interactive CD-ROM storybook on the

simple view of reading, an existing cognitive theory of multimedia learning and proven multimedia design principles, the researcher will be able to fulfill the criteria for effective and high-quality talking book software.

Target Learners

Children today are confronted by a varying range of media. Technology has besieged students with plenty of choices on which to spend their time. According to a survey conducted in one private school for boys, a grade school student today spends up to 75% of his time watching television, videos and movies, listening to the radio, using the computer and cellular phone, surfing on the Internet and playing video games. It has become more of a challenge to fit reading into this frenetic schedule. Faced with such competition, the challenge is on for educators to seek other ways of getting children to start and continue reading, inside and outside the classroom.

In the aforementioned survey, 90% of grade school students had computers with internet access at home. They are exposed to the latest state-of-the-art technology and are familiar with being around it and using it for educational purposes. Consequently, they are receptive and open to new uses of technology. Within the school, they have access to three information technology laboratories and a TV-monitor personal computer within each classroom. These facilities provide access to the Internet and technological tools for the teacher and student alike.

Features of the Electronic Storybook

The proposed module seeks to utilize an original electronic storybook as an instructional tool for helping support reading comprehension. The electronic storybook's intended audience is the third to fourth grade level of the private school for boys. Their age range is from 8-10 years old, and as such, the activities of the storybook focused more on language comprehension rather

than decoding exercises. The electronic storybook offers interactivity and multimedia utilities, and focuses on developing vocabulary and comprehension skills. Vocabulary words in the story are marked and clickable. Once clicked, a small window appears with questions about the word's definition. These questions utilize contextual and picture clues. Comprehension skills include learning word meaning from contextual clues, noting details in the story, making inferences, making predictions, sequencing, relating content to personal experience, and identifying the moral lesson.

Comprehension is further assessed in two ways: through a comprehension test which allowed students to view the story in text while answering questions, and the challenge pages, which ask one comprehension question for each multimedia page within the electronic storybook. The comprehension test can be accessed by clicking on the link found on the opening page of the storybook, while the challenge pages can be accessed by clicking the quiz icon found at the bottom of each story page. In addition, the comprehension test automatically computes the score of the student at the end, while the challenge pages offer instant feedback to the child by virtue of voice and text prompts that tell him whether he got a right or wrong answer.

Other features include colorful drawings, animation embedded within the storybook pages, a clickable audio narration of the story and the help page.

Overview of Scripting and the Storyboard

In collaboration with Mr. Galvin Ngo, the researcher formulated and created the electronic storybook entitled "Li-Ang and the Magic Spring" in the CD-ROM format. This story was taken from the researcher's previous work and edited to update its ending. Drawings were illustrated by Mr. Alwin Macalalad. The researcher helped in coloring and layouting. Voices were done by Jonjee Sumpaico, S.J., Aaron Ong and the researcher.

Macromedia Director was the software utilized to create the interactive storybook, while Adobe Photoshop and Wavepad were utilized for picture and sound editing, respectively.

The module included a lesson plan created using the Ignatian Pedagogical Paradigm. The teacher can insert the module in the curriculum as an alternative to the typical paper storybook discussion.

Pilot Testing

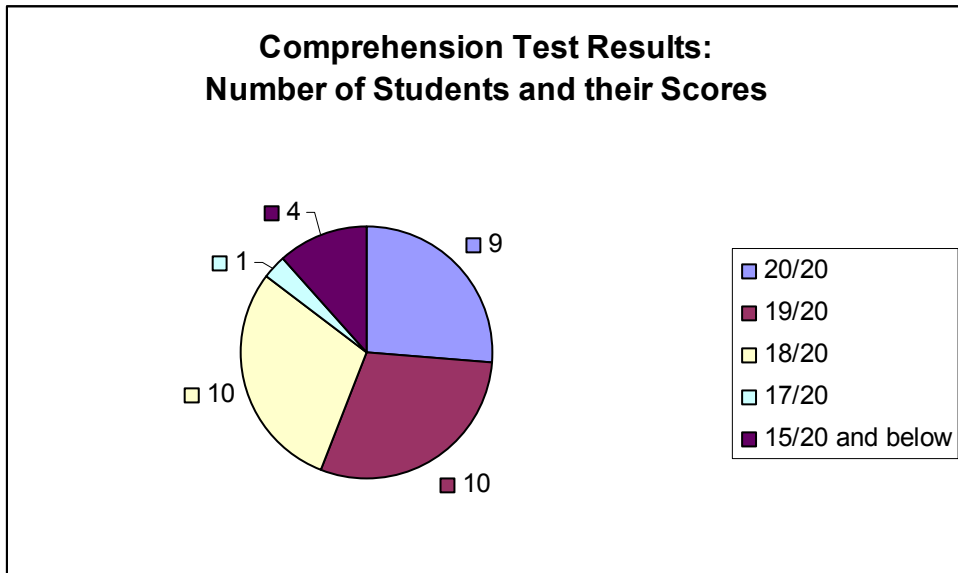
The pilot testing of the module was conducted on October 7, 2004 in a private grade school for boys. The testing was done using two straight periods in the morning. The children's regular reading teacher conducted the module for the class composed of 34 students.

After a short prelection in the classroom, the teacher brought the students to the computer laboratory where there was a short orientation using the interactive storybook's help page. The students received instruction on how to navigate through the book and on how to access the storybook's features. They were then given 20 minutes to finish reading the story and access the vocabulary and challenge pages. All the students wore headphones to allow them to listen to the narration and music of the interactive storybook. Some of the readers were able to read through the story at a faster rate than others, allowing them to reread the story as a result.

When most were finished with the story, students answered the comprehension quiz. There were technical problems encountered with the grading of the comprehension quiz, so as a contingency, the researcher used paper sheets to record the students' answers aside from the computer program. The students were not allowed to change their answer nor were they permitted to go back to the previous question. However, they could take the test again if they so desired. An option to view the answer key was provided at the end of the test if in case any of the students wanted to check their answers manually.

Results of the comprehension test as measured by the paper sheets are shown below.

Figure 2 : Comprehension Test Results



The passing score of the test was 15/20, or 75% of all the questions.

88.24% of the class passed the comprehension test, with 85.29% of the class scoring 90% and higher. This was equivalent to 29 boys out of 34. All signs point to the success of the pilot testing of the book with regards to facilitating comprehension.

The students then answered a 5-point scale survey which rated the different aspects of the interactive storybook. These aspects included the vocabulary words, challenge pages, animation, still pictures, story and concentration and attitude towards having reading another interactive storybook in the future.

Around two-thirds of the students rated the vocabulary pages as effective in helping them learn new words. Results showed that most of them got perfect in the vocabulary section of the comprehension test, which supported their affirmative statements. Twenty-eight students rated the challenge pages as a good test of their understanding of the story and also ranked the

animations as creative and colorful. Twenty-three students rated their concentration as being adequate while answering the storybook.

While more than one-third of the students (12 of 34) had no opinion of the still pictures in the storybook, sixteen others ranked the pictures highly. One student did not like the main character's picture and preferred him to have hair instead of being bald. Another suggested that the main character be drawn as more "handsome."

Twenty-five students rated the story favorably. Remarks branded the story as "fun and interesting," "perfect" and as one that "teaches moral lessons and encourages young readers to read and explore."

Thirty-two out of 34 expressed their desire to read another interactive storybook. Only one student strongly opposed using more interactive storybooks in the classroom, while another had no opinion. It should also be noted that this is the first time that a reading class has used an interactive storybook for reading, so there may be a novelty factor attached to the students' desire for more examples of interactive storybooks. Future observations of sessions that use interactive storybooks are recommended in order to further measure its effects on students' motivation.

Students' Survey Questions

There were three other questions in the survey sheet that the students answered. For the first question, they were asked if they liked an interactive book or paper book better, and why. A few statements supported paper books, with some stating "You can use your imagination when there aren't any pictures," "It's more fun," and "It doesn't damage the eyes and you can read it again."

Majority of the students chose interactive books over paper books, labeling it as “better and fun” and “futuristic.” In addition, children stated that they “did not need to turn the pages” anymore. They mentioned the moving pictures, music, narration and animation as factors for their decision. It seemed that they enjoyed hearing the story being told to them, instead of just reading it on their own. Another student mentioned the availability of the vocabulary and challenge page pop-ups which are unavailable in paper books.

Another question looked at the students’ perception of paper and interactive books. Paper books were seen as “hard to read,” “boring,” and having “no animation and narration.” Another student mentioned that there weren’t too many pictures in a paper book. One pupil mentioned though that he still considers the two mediums as books, making them similar to each other. On the other hand, the interactive book received glowing reviews. It was labeled as “more fun” and “more modern.” Students pointed to its interactivity and multimedia features as positives. They enjoyed using the challenge, help and navigation buttons. Other responses stated that “the interactive book is faster to read even when you’re a slow reader ... you need more time with a paper book.” “The interactive book read the story for you so that you can read the story by yourself ... unlike paper books, you don’t know how to read some words out loud.” It seems that the students enjoyed the independence afforded them by the narration feature of the interactive storybook. This narration enabled them to read along with the speaker, and as such lessened their mental effort, making it “easier to read.”

The students gave generally positive comments, with a few scattered negative remarks. Students suggested a volume button for the narration and sounds, more “realistic” pictures, and more animation and surprises. One even suggested having all the pictures move in order to make the interactive storybook more interesting.

These comments will be taken into consideration for future studies. It is important to remember though that the design of interactive storybooks must still enable the child to learn and not just be entertained. As such, a delicate balance needs to be met when creating and designing such an endeavor.

Other Observations

Some students were observed to use the mouse as a pointer to the text while listening to that section during the narration. Others maintained eye contact with the screen as they read silently. The narration feature was one element of the storybook that was accessed considerably.

Other students were observed to be merely clicking on the letters and waiting for the program's feedback of "Good work" or "Try again" instead of reading the text. This "click-happy" behavior merits consideration in future studies or pilot testing. Some would look to their seatmate's computers if he had any questions on what he was encountering. Most students raised their hands for questions as instructed to do so, while others asked their seatmates.

The class was also instructed to concentrate on reading the story text first before accessing the hidden surprises within the pictures. This was done to ensure that they would read. It was observed though that even if students were answering challenge and vocabulary pages while reading the story, majority were still able to obtain a high comprehension quiz score.

Problems occurred when the comprehension quiz miscalculated the final score of the students. A paper answer sheet was thus provided as an alternative to the electronic version. This was necessary in order to assess the students' comprehension. One student was unable to answer this properly because he got confused with the numbering of the answer sheet, which was different from the numbering of the electronic version. His test was rechecked as a result.

Another difficulty also arose when the faster readers were done reading the story. They were told to wait for the rest of the class before taking the comprehension test. As a result, some of them became restless and had to be reminded sternly by the teacher not to create noise in the laboratory. Clearer instructions on what to do after reading the story would have to be stated.

A key consideration was also class size. It was quite difficult for one teacher to answer the individual questions of 34 students. A suggested solution to this is a lengthier demonstration session on the features of the software to provide a venue for questions about it.

In general, students seemed intent on finishing the storybook and proceeded through it as expected, with some pausing their reading to access the vocabulary and challenge pages. Those who finished ahead of schedule were told to reread the story or to access the other features.

The Instructor's Survey Questions

The instructor also answered a survey and rated the overall presentation highly. However, she still expressed her preference to teach a paper book. This was because she found the activity more suited to a class with a smaller size. She also recommended the module for students who were well-versed in using the computer. She suggested that a higher grade level would benefit more from the module. She also mentioned that the interactive storybook successfully held the attention of her students as an “engaging” piece of material.

The instructor was very impressed with the content and organization of the storybook. She suggested that the teacher have more control over the pace of the lesson, particularly the comprehension quiz. This was one possible way of improving its effectiveness.

Conclusion

The favorable results of the pilot testing point towards the support of reading comprehension by the electronic storybook and the accompanying module. An overwhelming

majority of the students also showed the desire to read more electronic storybooks in the future, as recorded in the survey questionnaire.

It is noted though that the instructor was hesitant to use interactive storybooks in the reading classroom. This may be due to several factors such as the time element, class size, comfort level with computers and technology, or a lack of exposure to the capabilities of information communication technologies. A possible solution to this would be an introduction to the different methods of using interactive storybooks in the classroom as well as training sessions on how to teach effectively in a technologically-enhanced setting.

Recommendations

This study sought to create and develop an original electronic talking book and accompanying module in order to facilitate reading comprehension. With this regard, it can be said that the objective was accomplished. The high results of the comprehension test within the electronic storybook showed that this medium can support the acquisition of reading comprehension skills. It was also noted that students had a favorable response to the future use of electronic storybooks as an alternative to paper books. This research is an encouraging indicator of the untapped potential of information communication technologies within the classroom.

At present, information communication technologies already have much to offer to the field of education. It is thus the job and task of educators to ensure that this promise turns into tangible results for our students. Educators must seize the opportunity to create and integrate effective information communication technologies with educational materials and tools in order to produce meaningful learning. They can no longer be content with letting commercial software developers dictate the pace of computer-based learning, but rather involve themselves in the

process of creating effective educational tools. Collaboration between the two industries of education and software design is essential to achieving a successful learning outcome.

Interactive books that are created according to a cognitive theory of multimedia learning provide one way of reaching this goal. Based on the overall results of the pilot testing, it is recommended that future studies be conducted on exactly how these interactive storybooks support reading comprehension and affect motivation. Research can also be done on the most effective ways of utilizing these educational tools and the Internet within the classroom and beyond.

Training must be conducted to introduce educators on how to use the various computer tools available. Support must also be given to those educators who are already using them. These steps may help lead to the gradual acceptance of information communication technologies as a helpful tool for learning and literacy.

Students have already shown a great willingness to integrate technology into their lessons. Educators and software designers must take advantage of this positive attitude. At the same time, it also becomes increasingly valuable to teach and remind students of the importance of literacy in whichever medium they encounter it. Students must develop into independent capable learners who are equally at ease with paper books and electronic media.

With these recommendations firmly in place, the vision of a literate and technologically capable society moves within reach, and the goal of creating lifelong independent learners moves one step closer to being reality.

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